Dynamics (chapter 5 + 8.1 universal gravitation + Hooke's Law)

Dynamics - study of Forces.

Force - something that causes acceleration - changes in motion or shape
- a push or a pull

units: Newton, N = kgm/s^2
force is a vector quantity - need to include direction
measure with a spring scale

kg is a measure of mass - the amount of material
weight is the force of gravity on an object, in physics we measure weight in Newtons, not kg.

Demo:
card with a coin on it
pull the card quickly, the coin falls
pull the card slowly, the coin moves with the card

What's the deal?
- the coin has inertia - tendency to not accelerate
- an unbalanced force is required to accelerate an object
- when you pull quickly, the force of friction

between the coin and the card is not enough to accelerate the coin with the card
- when you pull slowly, the force of friction is enough to accelerate the coin with the card

Newton's Laws
First Law - Law of inertia
Objects at rest, tend to stay at rest. Objects in motion, tend to stay in constant speed linear motion. Rest and motion are altered if unbalanced forces are applied.

Unbalanced force - force one way is not countered by a force the other way.

The net force, F_{net}, is the vector sum of all forces.
$F_{net}=\Sigma F$

Newton's Second Law - Law of acceleration
Objects accelerate proportionally to the net force and inversely to the mass.
$a=F_{net}/m$ or $F_{net}=ma$

eg.
1. You pull a 2.0 kg cart with 3.0N of force.
a) if the friction of the wheels is negligible, what is the acceleration of the cart?
b) if you pull 2.0 kg of wooden blocks with 2.0 N of

force, they slide at a constant velocity. What is the i) acceleration ii) force of friction, F_f iii) force of gravity, F_g iv) force the ground pushes up on the cart (the Normal force, F_N)

c) if you pull the 2.0 kg of blocks with 3.0 N of force assuming they have the same force of friction from b, what is the i) net force ii) acceleration

d) the coefficient of friction, μ, is defined as the ratio of the force of friction to the normal force.

$\mu = F_f / F_N$ what is the coefficient of friction for the blocks?

e) How could you determine factors that influence μ experimentally? Lab next week.

p92 - 100 q 1-12, CR 1.1 - 1.4 binder check Friday